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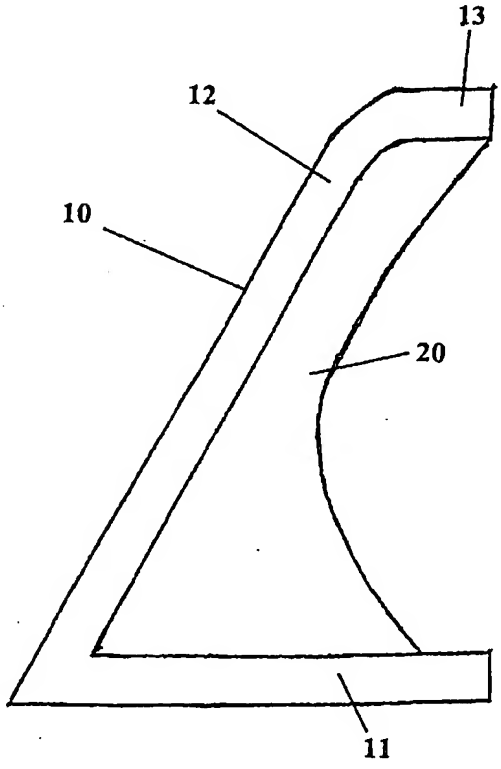
(54) Title: NOISE REDUCTION MEANS



(57) Abstract: A noise protector for a road or railway comprising a sound absorber (20) that is manufactured from a rubber granulate that is bonded with the aid of a binding agent, comprising a sound-reflecting framework (10) manufactured from a material that is harder that the material of the sound absorber (20). The framework (10) is fully or partially clad with the sound absorber (20) on the side that is intended to face the source of sound. The framework (10) demonstrates an upper part (13), a base part (11) and a rear part (12) on which the sound absorber (20) is arranged such that the sound absorber is surrounded by the upper part, the rear part and th ebase part and has one side intended to face the road.

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Noise Reduction Means

Technical area

The invention principally concerns noise protectors to be used at railways and roads where environmental requirements require a lower level of noise than that which previously known constructions have been able to demonstrate and without these constructions influencing surrounding environmental and aesthetic requirements, just as the construction in itself must be able to resist the influence of the weather in various climate zones. The noise protector comprises a sound absorber that is manufactured from a rubber granulate bonded with the aid of a binding agent.

The Prior Art

Various methods are known of compressing or moulding rubber waste alone or in combination with other products to [form] porous material for the damping of sound and vibrations or for the purposes of insulation. The noise protector according to the invention is a further development of the product according to the Swedish patent application numbered 9700799-1 with the publication number SE, C2, 513102. There, a noise protector manufactured from rubber waste mixed with a binding agent is described, in which the binding agent remains soft even after cold hardening. The document does not describe any special arrangements or constructions for adaptation to weather or environmental conditions.

Summary of the described invention

The noise protector in a first embodiment of the present invention comprises a sound absorber that is manufactured from a rubber granulate that is bonded with the aid of a binding agent, and a framework that is manufacturer from a material that is harder than the material of the sound absorber. The framework is partially or fully clad with the sound absorber on that side which it is intended should face the source of sound. The framework has a hard surface on which the sound absorber is arranged. It is a special characteristic that the framework is manufactured from concrete and constitutes part of a free-standing element that demonstrates a base for placing on the ground or similar, from which a part that protrudes from the base extends, and that the sound absorber is arranged at least on the protruding part. The protruding part forms an angle with the base, and the sound absorber is arranged between the base and the lower surface of the section at an angle. The protruding part demonstrates an upper section that extends parallel to the base, and the sound absorber is arranged on the lower surface of the upper section.

One preferred embodiment of the present invention comprises a noise protector for placing next to a road or railway. The noise protector comprises a sound-reflecting framework and a sound absorber manufactured from rubber granulate, for example, granulate from car tyres, mixed with a binding agent, whereby the framework comprises an upper part, a base part and a rear part against which the sound absorber is applied such that the sound absorber is surrounded by the upper part, the rear part and the base part and has one side intended to face the source of sound on the road or railway. The base part in one preferred embodiment of the noise protector has an upper surface that demonstrates, when the base part stands on a horizontal surface, a gradient away from the rear part in the direction of the road or railway in order to allow liquid to drain away. The upper part in one preferred embodiment of the noise protector has an upper surface that is convex rounded in order to prevent the accumulation of dirt and liquid.

A second preferred embodiment of the present invention is an arrangement for the damping of noise at a railway with a noise protector comprising a sound-reflecting framework and a sound absorber produced from rubber granulate mixed with a binding agent, whereby the framework comprises an upper part, a base part and a rear part against which the sound absorber is applied such that the sound absorber is surrounded by the upper part, the rear part and the base part and has one side intended to face the railway. The noise protector in this arrangement is placed onto an embankment of coarse macadam in such a manner that the noise protector is arranged on a finer macadam that is separated from the coarse macadam by a mat, such as a geotextile mat. The mat allows liquid to pass through but holds the fine macadam in place. It is a special characteristic that the finer macadam is placed into a ditch in the coarser macadam of the embankment and the mat is placed such that it essentially follows the shape of the ditch.

A third preferred embodiment of the present invention specifies a method for noise protection at a railway in which a noise protector is placed on an embankment of coarse macadam by making a cavity in the form of a ditch in the embankment, a mat is applied in the cavity and a finer macadam is applied in the mat after which the noise protector is placed onto the finer macadam. The noise protector, which is used according to the method, comprises a sound-reflecting framework and a sound absorber manufactured from rubber granulate, for example, car tyre granulate, mixed with a binding agent, whereby the framework comprises an upper part, a base part and a rear part against which the sound absorber is applied such that the sound absorber is surrounded by the upper part, the rear part

and the base part and has one side intended to face the source of sound on the railway. The base part has, in one preferred embodiment of the noise protector, which is used according to the method, an upper surface that, when the base part stands upon a horizontal surface, demonstrates a angle with the rear part in the direction of the railway in order to allow liquid to drain away.

Important properties of the present invention are that it prevents the accumulation of water, it is self-draining and it prevents the problems to which the formation of ice gives rise.

Brief description of the drawings

In the subsequent description, reference will be made in the text to the attached drawings for a better understanding of embodiments and the examples that are presented, whereby:

Fig. 1 shows a cross-section of the noise protector according to the present invention for placing beside a road or railway.

Fig. 2 shows a cross-section of one preferred embodiment of a noise protector according to the present invention.

Fig. 3 shows a cross-section of one preferred embodiment of a noise protector according to the present invention placed onto finer macadam on an embodiment of coarse macadam.

Detailed description of preferred embodiments

The invention concerns a noise protector whereby disturbing levels of sound are to be efficiently reduced in places where the technology can be best adapted.

A sound absorber of rubber granulate from car tyres is included in the noise protector according to the invention. The granulate is bonded by a binding agent, which mixture can, among other things, be moulded into or surrounded as a plate by a supporting framework of, for example, concrete. The characteristics of the invention are made clear by the attached claims.

The combination of the sound absorber and the supporting framework means that these two materials form in this way a unit or a building element. The sound absorber collaborates with the surrounding framework of, for example, concrete of a density that is commonly found, just as well as with light-weight concrete, wood, steel and other supporting material with a hard surface that reflects sound to a certain degree. The sound absorber is manufactured from rubber granulate in pieces whose size ranges from 5 to 15 cm, depending on the area of application whereby these pieces are mixed with a cold-hardening binding

agent, after which the mixture hardens in air once it has been shaped according to requirements. The sound absorber demonstrates a cavity that ensures that sound can pass into the absorber and damped against the rubber granulate and the binding agent.

A sound absorber designed in the form of a plate with both different formats and different thicknesses can be used as a sound absorber on constructions that already exist, which in this way function with a further purpose as noise reducers.

The binding agent that is used remains flexible after the hardening. It is free of chemicals that are today known and classified as dangerous to health. Thus, there arise no known risks to health when handling [the binding agent]. Furthermore, the binding agent, in contrast to most other commonly found binding agents used for the same purpose, is not flammable.

The weight of the construction allows it to be placed relatively close to the source of sound for efficient absorption of sound. In this way, the height of the noise protector can be adapted as required and with consideration of the conditions with respect to traffic noise, which means that neither those living nearby nor travellers need be unnecessarily disturbed, something that is currently common with the higher constructions that are available on the market. The weight of the construction also means that it can be placed onto flattened ground without complex attachment means while still satisfying rigid requirements for safety. The weight makes it possible for the invention to be placed near to a railway with the sound absorber facing the principal source of sound that is constituted by the contact of the wheels of the train with the rails.

Noise protector elements can, furthermore, function as barriers and protection for workers during roadworks or as dividers between road carriageways, just as they can be used, with a suitable design, as platform elements or as supporting walls for road embankment with the sound absorber facing the road. The concrete shell can be equipped with moulded holders for further environmental adaptation if it is desired to clad the elements in, for example, wood. All embodiments are, independent of the design, maintenance-free in all weathers, and all embodiments can be cleaned from dirt using high-pressure washing. Both sides of the protector can be painted or coated as required with reflective paint or paint with a luminous or warning effect. The concrete shell has the advantage of being relatively insensitive during transport and during, for example, lifting operations in association with preparation of the noise protector.

It is obvious for one skilled in the arts that the collaborative elements according to the invention can be designed in different sizes, with different patterns and profiles, and with different colours according to any desires and requirements that are placed upon them.

Thus the construction of the present invention makes possible a very cost-efficient damping of sound which is favourable for the environment in several ways. It is a not inconsiderable advantage that the possibility of recycling tyre waste increases through the invention by a solution that is well adapted with respect to both economic and environmental aspects with the aim or reducing noise disturbance in residential areas close to highly trafficked routes. The noise protector can be designed in an aesthetically pleasing manner such that it does not disturb the neighbourhood or obstruct the view of neighbours or travellers.

The invention will be described in more detail with the aid of examples according to Fig. 1, which shows the principle for a noise protector intended for use along a railway.

A framework 10 has been manufactured from concrete and/or another heavy material and partially encloses a sound absorber 20 manufactured from rubber granulate. The framework 10 comprises a base 11, from which a protruding part 12 extends at an angle to the base 11, and at whose upper section an upper part 13 extends parallel to the base 11. The sound absorber 20 is arranged on the lower surface of the section at an angle 12 and on the upper section 13, and further along the upper surface of the base 11.

The example of execution according to Figure 1 is intended to be used as noise protector beside a railway. The application of the sound absorber increases the ability to reduce sound through the pathway of the sound both into and out from the sound absorber, to the extent that it is reflected against the rear wall of, for example, concrete or other material that is used.

Practical measurements in the field have shown a sound reduction of 10 - 14 dB in the absence of the surrounding concrete. According to field and laboratory tests of prototypes produced with the aim of reducing sound next to a railway, the said combination of a sound absorber and a supporting framework makes it possible for disturbing sound to be reduced by a further 4 - 5 dB greater than the field testing carried out has shown, when the sound absorber has not been enclosed. The prototypes in these measurements were 70 cm high, 10 cm of which was constituted by the concrete base, and they were placed 1.5 m from the closest rail. The construction proved to have a particularly high ability to absorb sound and the high sound levels to which modern high-speed trains give rise.

In an alternative embodiment of the invention, the construction has a relatively greater weight than earlier prototypes and can therefore be placed 0.5 - 1.0 m from the sound source without expensive anchoring measures while still satisfying requirements for safety placed on it. The location closer to the sound source has a major significance for the sound-absorbent and thus damping ability of the sound absorber.

Figure 2 shows a cross-section of one preferred embodiment of the present invention in which the base part 11 demonstrates an angle such that water can drain off, and in this way does not collect. The sound absorber 20 demonstrates a cavity that allows a certain amount of flow-through of water. The upper surface 14 of the base part 11 forms an angle with the upwardly extending section, the rear part 12, such that when the lower surface 15 of the base part lies flat, horizontally against a support, natural drainage of any water is obtained from the rear part (the upwardly extending section) 12 towards the source of sound, for example, in the direction of the railway rails. The formation of ice is counteracted by the drainage, while at the same time, a certain self-cleaning is achieved by rainwater carrying dirt with it and draining away from the base section. The upper part (the upper section) 13 has an upper surface 16 that is rounded convex and prevents the accumulation of water and dirt on the upper part. This is also an advantage when the sound absorber is rinsed off during cleaning in that the water runs off from both the base part and the upper part without needing to be scraped or wiped away.

Figure 3 shows one arrangement for a preferred embodiment of the present invention adapted for the damping of noise next to a railway. Railways normally have an embankment of coarse macadam 30, on which the rails are placed. Noise can leak through the macadam and under the noise protector when using noise protectors that are placed directly onto this coarse macadam. The noise protector can be supplemented with a support of finer gravel or crushed macadam 32, in order to counteract this noise leakage. The macadam under the noise protector is excavated such that a small ditch is formed, into which a mat 31 of, for example, geotextile, is placed, after which the ditch is filled with finer gravel 32. The noise protector is then placed onto the gravel. Other materials permeable to water may also be used as a barrier between the coarser and the finer macadam. Figure 3 shows one arrangement for noise protection beside a railway comprising a noise protector, with a framework 10 and a sound absorber 20, which is placed onto a base of finer crushed macadam 32 separated from the coarser macadam 30 of the embankment by a mat 31. The mat prevents the finer gravel 32 from sinking down through the coarser gravel 30. Thus, a greater damping and absorption of

noise under the noise protector is achieved by using a finer gravel. The mat allows water to penetrate during rain and washing, but it prevents the finer gravel from being washed away or being washed down into the coarser macadam. In this way, the finer gravel or sand is prevented from running down into the embankment and binding water, which would give rise to the risk of subsidence in the embankment and displacement of the rails on freezing of the water.

The angle that is displayed by the upwardly protruding part, the rear part, in the figures displaces the centre of gravity towards the source of sound. When a train passes, the cushion of air that it carries with it exposes the noise protector to a torque that tends to knock it over. Since the construction has a displacement of the centre of gravity towards the sound source and thus towards the air cushion of the train, it achieves a greater counteracting torque that that which a construction with a directly vertical upwardly extending part would have. It would also be possible to achieve a greater counteractive torque by extending the base part in the direction away from the source of sound such that the part that lies in contact with the ground is larger. Displacing the centre of gravity towards the source of sound / the cushion of air instead of making the construction wider makes it possible to place the noise protector between railway tracks, in the limited space that is available between them. This space has a minimum width that is normally intended for the placing of signs and light signals for the train traffic. Thus the invention in this embodiment is well suited to be placed in the limited space between two railway tracks.

Claims

1. A noise protector to be placed alongside a road or railway comprising a sound-reflecting framework (10) and a sound absorber (20) manufactured from rubber granulate mixed with a binding agent, c h a r a c t e r i s e d in that the framework comprises an upper part (13), a base part (11) and a rear part (12) onto which the sound absorber is applied such that the sound absorber is surrounded by the upper part, the rear part and the base part and has one side that is intended to face the road or railway.

2. The noise protector according to claim 1, c h a r a c t e r i s e d in that the base part (11) has an upper surface (14) that, when the base part stands on a horizontal surface, forms an angle with the rear part in a direction towards the road or railway in order to allow liquid to drain away.

3. The noise protector according to claim 2, c h a r a c t e r i s e d in that the upper part (13) has an upper surface (16) that is rounded convex in order to prevent the accumulation of liquid and dirt.

4. An arrangement for damping of noise next to a railway comprising a noise protector according to any one of the preceding claims for placing onto an embankment comprising coarse macadam (30), c h a r a c t e r i s e d in that the noise protector is arranged on a finer macadam (32) that is separated from the coarser macadam by a mat (31), such as a geotextile mat.

5. The arrangement according to claim 4, c h a r a c t e r i s e d in that the finer macadam (32) is placed in a ditch in the coarser macadam (30) of the embankment, and that the mat (31) essentially follows the shape of the ditch.

6. A method for noise protection next to a railway in which a noise protector according to any one of the claims 1, 2 or 3 is placed onto an embankment of coarse macadam (30), c h a r a c t e r i s e d in that a cavity in the form of a ditch is made in the embankment, that a mat (31) is applied in the cavity and that a finer macadam (32) is applied in the mat and that the noise protector is arranged on top of the finer macadam.

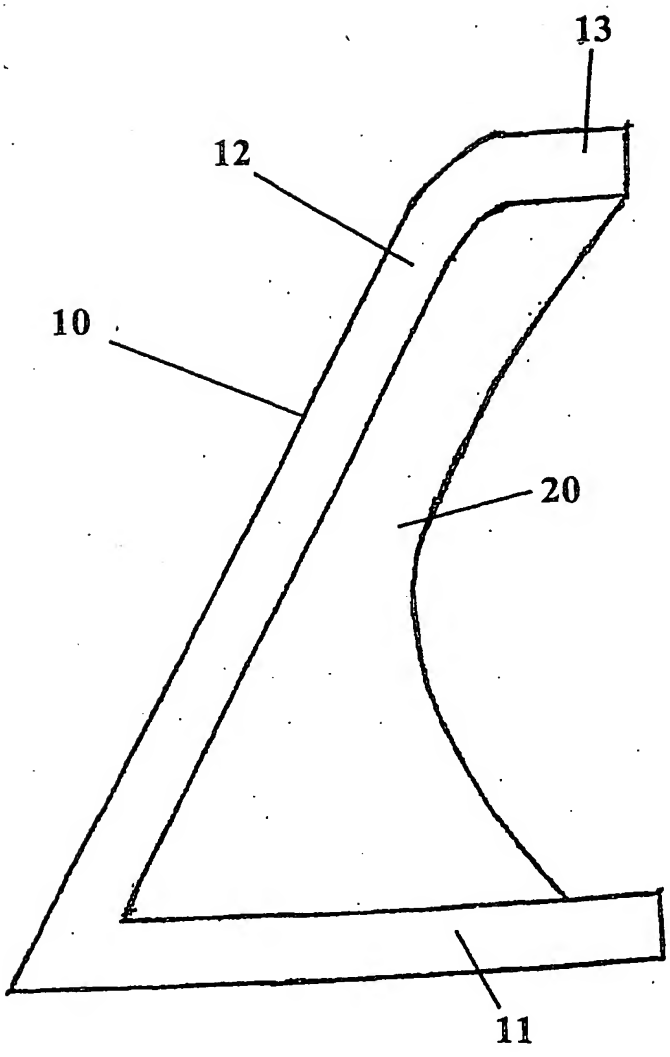

Fig. 1

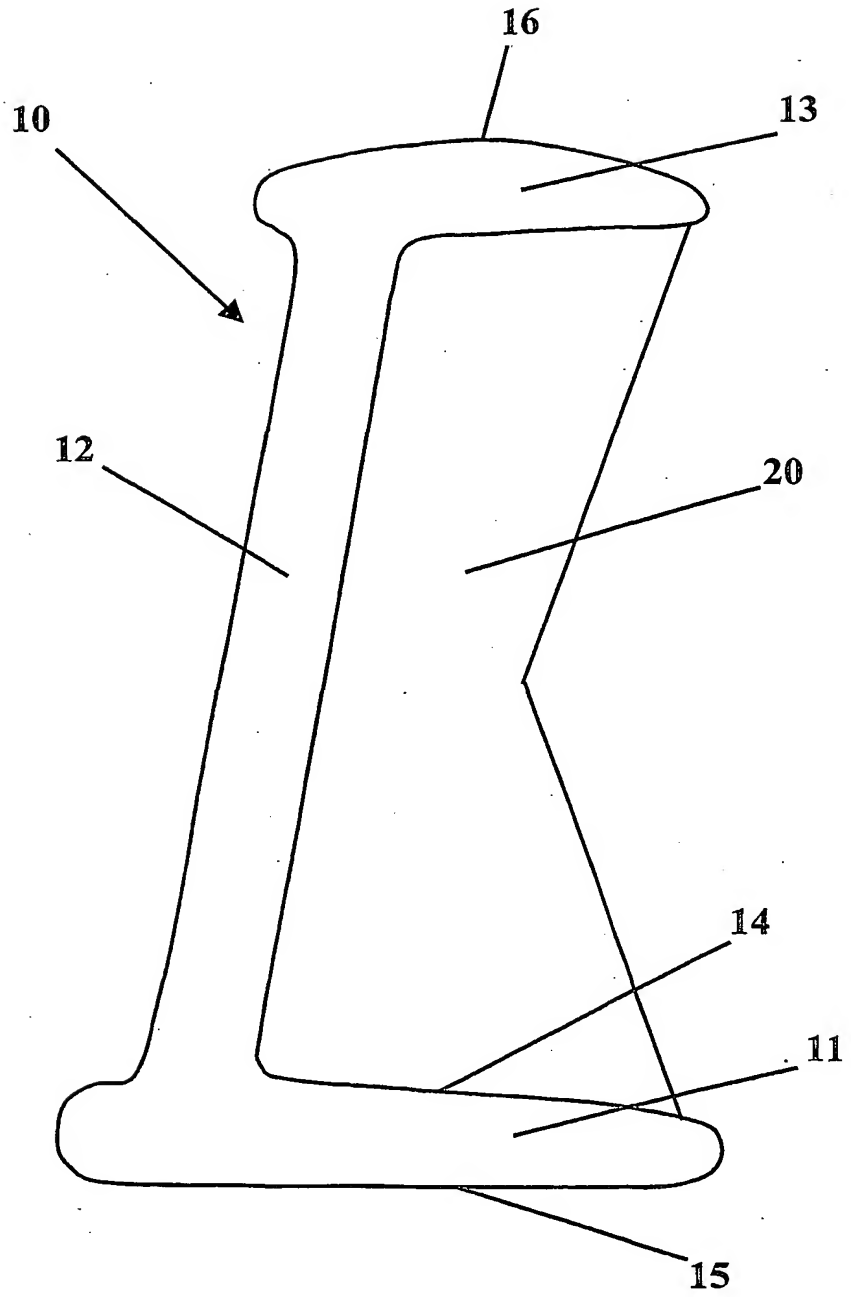

Fig. 2

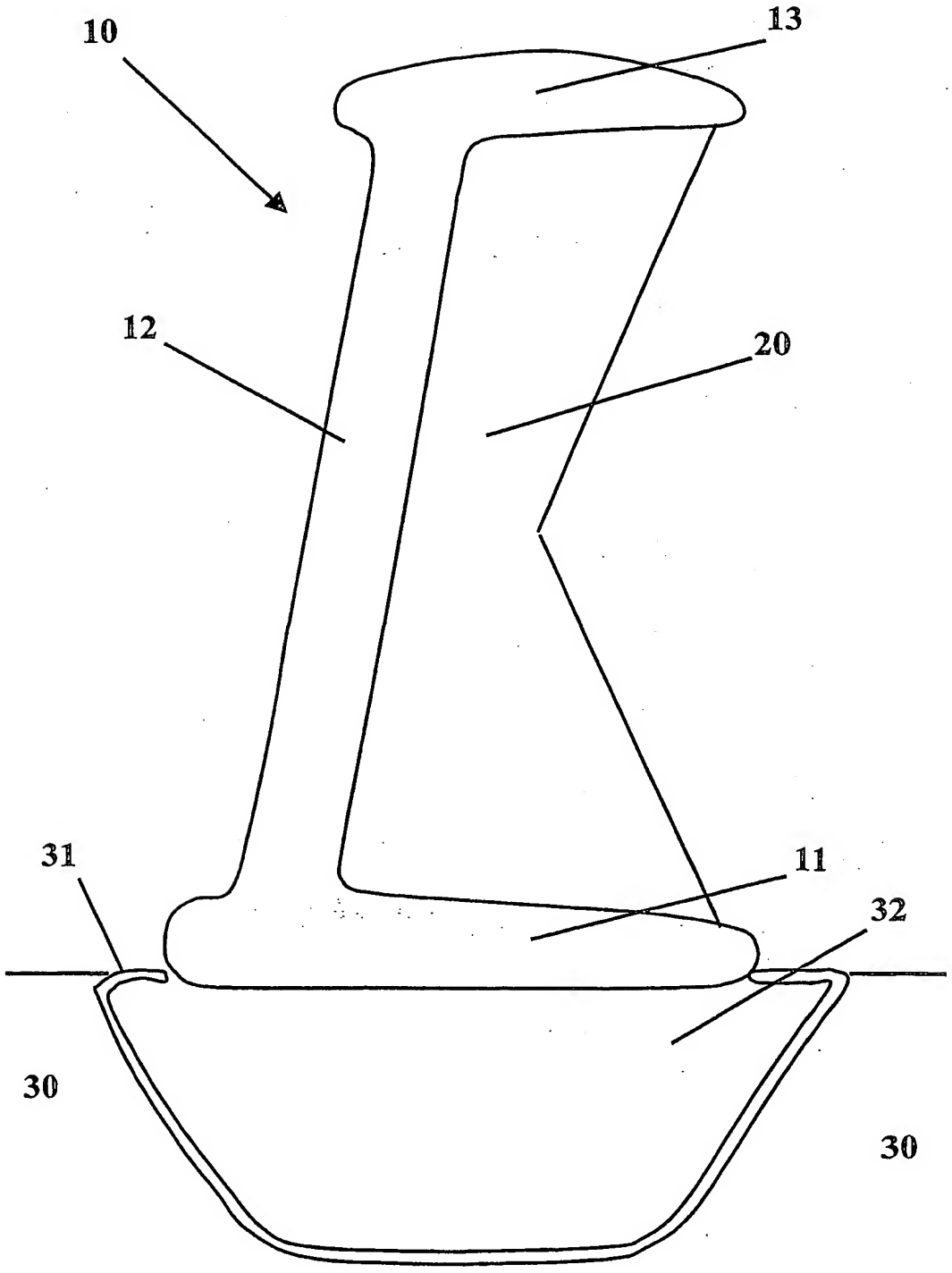

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/01608

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E01F 8/00, B29B 17/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E01F, E01B, E01C, E02D, B29B, B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO INTERNAL, WPI DATA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A		4-6
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A		4-6
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A	DE 19601783 A1 (HATLAPA, ROLF), 24 July 1997 (24.07.97), figure 2, abstract	1-6
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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22 October 2001	24 -10- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ulrika Nilsson/ELY Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/01608

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

01/10/01

International application No.
PCT/SE 01/01608

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